

CLAIMS

WE CLAIM:

1. A microelectromechanical system (MEMS) comprising:
(12) a beam supported on flexible transverse arms to move longitudinally along a substrate, wherein ends of the arms removed from the beam are connected to the substrate by flexible elements (46?) allowing transverse movement of the ends of the arms.
2. A microelectromechanical system (MEMS) comprising:
a beam supported on flexible transverse arms to move longitudinally along a substrate, wherein ends of the arms removed from the beam are connected to the substrate by flexible longitudinally extending wrist elements (46).
- X 3. The microelectromechanical system of claim 2 wherein the wrist elements join to the arms via an arcuate section.
4. The microelectromechanical system of claim 2 wherein the wrist elements are serpentine.
5. The microelectromechanical system of claim 4 wherein the ends of the arms removed from the beam are serpentine.
6. The microelectromechanical system of claim 2 wherein the ends of the arms removed from the beam are serpentine.
- X 7. The microelectromechanical system of claim 2 wherein the beam is supported at longitudinally opposed ends by respective pairs of transverse arms extending from the beam on opposite sides of the beam and wherein the wrist elements for the transverse arms extend in a longitudinal direction toward the center of the beam.
8. The microelectromechanical system of claim 2 wherein the beam is supported at opposed ends by respective pairs of transverse arms extending from the

beam on opposite sides of the beam and wherein the wrist elements for the transverse arms extend in a longitudinally direction away the center of the beam.

9. The microelectromechanical system of claim 2 wherein the transverse arms and wrist elements are conductive.

10. The microelectromechanical system of claim 2 wherein including a magnetic field.

11. The microelectromechanical system of claim 2 wherein the beam is supported at its center by a pair of transverse arms extending from the beam on opposite sides of the beam and wherein the wrist elements for the transverse arm extend in opposite longitudinal directions.

12. The microelectromechanical system of claim 2 wherein the beam is supported at longitudinally opposed ends and at an intermediate point by respective pairs of transverse arms extending from the beam on opposite sides of the beam and wherein the wrist elements for the transverse arms at the opposed ends of the beam extend in the same longitudinally direction and wherein the wrist element for the transverse arms at the intermediate point of the beam extend in opposite longitudinal directions.

13. The microelectromechanical system of claim 2 wherein the transverse arms are of equal length.

14. The microelectromechanical system of claim 2 wherein a point of attachment of the transverse arms at the intermediate point is centered between points of attachment of the transverse arms at the opposed ends of the beam.

15. The microelectromechanical system of claim 2 wherein a first opposing of the beam supports an actuator selected from the group consisting of a Lorentz force motor, an electrostatic motor, a piezoelectric motor, a thermal-expansion motor, and a mechanical-displacement motor.

16. The microelectromechanical system of claim 2 wherein the center arm supports a sensing device selected from the group consisting of: a capacitive sensor, a piezoelectric sensor, a photoelectric sensor, a resistive sensor, an optical switching sensor and an inductive sensor.

17. The microelectromechanical system of claim 2 wherein the ends of the transverse arms removed from the beam are connected to a free end of a transverse expansion element attached to the substrate only at a point proximate to the beam.

18. The microelectromechanical system of claim 2 wherein the beam is supported at longitudinally opposite ends by respective pairs of transverse arms extending from the beam on opposite sides of the beam and wherein the beam is sized to place the respective pairs of transverse arms in equal and opposite flexure.

19. The microelectromechanical system of claim 2 at least one pair of flexible transverse arms extends in a bow to present force increasingly resisting longitudinal motion of the beam in a first direction up to a snap point after which the force abruptly decreases.

20. A microelectromechanical system (MEMS) comprising:

a beam supported on flexible transverse arms to move longitudinally along a substrate, wherein ends of the arms removed from the beam are connected to a free end of a transverse expansion element attached to the substrate only at a point proximate to the beam.

21. A microelectromechanical system (MEMS) comprising:

a beam supported on flexible transverse arms to move longitudinally along a substrate, wherein the beam is supported at longitudinally opposite ends by respective pairs of transverse arms extending from the beam on opposite sides of the beam and wherein the beam is sized to place the respective pairs of transverse arms in equal and opposite flexure.

22. The microelectromechanical system of claim 21 wherein the respective pairs of transverse arms are flexed concavely with respect to the center of the beam.

23. The microelectromechanical system of claim 21 wherein the respective pairs of transverse arms are flexed convexly with respect to the center of the beam.

24. The microelectromechanical system of claim 21 wherein the transverse arms are of equal length.

25. The microelectromechanical system of claim 21 wherein a point of attachment of the transverse arms at the intermediate point is centered between points of attachment of the transverse arms at the opposed ends of the beam.

26. The microelectromechanical system of claim 21 wherein a first opposing of the beam supports an actuator selected from the group consisting of: a Lorentz force motor, an electrostatic motor, a piezoelectric motor, a thermal-expansion motor, and a mechanical-displacement motor.

27. The microelectromechanical system of claim 21 wherein the center arm supports a sensing device selected from the group consisting of: a capacitive sensor, a piezoelectric sensor, a photoelectric sensor, a resistive sensor, an optical switching sensor and an inductive sensor.

28. A microelectromechanical system (MEMS) comprising:
a beam supported on at least one pair of flexible transverse arms to move longitudinally along a substrate extending in a bow to present force increasingly resisting longitudinal motion of the beam in a first direction up to a snap point after which the force abruptly decreases.

29. The microelectromechanical system of claim 28 wherein the force changes direction after the snap point.

30. The microelectromechanical system of claim 29 wherein after the snap point the bow increasingly resisting longitudinal motion of the beam in a second direction opposite the first direction up to a second snap point at which the force abruptly decreases.

31. The microelectromechanical system of claim 28 wherein the second snap point is different from the first snap point.

32. The microelectromechanical system of claim 28 wherein the force maintains the same direction after the snap point.

33. A microelectromechanical system (MEMS) comprising:

a beam supported for longitudinal motion along a substrate on at least one pair of flexible transverse arms, a first of which is angled so as to also extend longitudinally;

5 a sensor detecting transverse motion receiving the first transverse arm at an end removed from the beam;

whereby longitudinal motion of the beam may be amplified for detection by the sensor.

34. The microelectromechanical system of claim 33 wherein the sensor is selected from the group consisting of: a capacitive sensor, an optical sensor, a resistive sensor, a piezoelectric sensor, and an inductive sensor.